2-0 Introduction

This section provides information for installing, connecting and operating Series 6000 Transducer Data Acquisition and Control Systems.

Two methods are available to program a 6000 data acquisition system; turnkey GRASP software, PI660, running under Windows 95, 98 or NT, or a high level GPIB instruction set. These instructions are for the PI660 software. The GPIB instruction set is covered in Section 12.

This manual only covers only those functions of the software necessary to configure, setup and operate the system. Users will want to consult their PI660 manual for complete software details. Users who purchase the software may skip the GPIB instruction set altogether. However, if problems should arise the GPIB instructions may be useful for determining if the problem is system, computer or software related.

2-1 Installation

Input/output modules mount in sixteen-slot mainframe or slave enclosures designed to be mounted in EIA 310C type 19-inch cabinets.

The mainframe enclosure contains the Digital Data Selector (DDS), PCM encoder (if supplied) and IEEE-488 control and data output interface. The 6000 and 6010 mainframes hold the initial 16 or 3 input/output modules respectively.

Slave enclosures, Model 6001, hold up to 16 additional input/output modules. Up to 31 slaves may be used with either mainframe. Input/output modules may have from 1 to 64 channels providing a total channel capacity of 32,768.

2-1.1 Mainframe and Slave Enclosures

Enclosures install in 19-inch EIA 310-C cabinets. The enclosures are 21.5 inches deep, but require at least 26-inch depth to accommodate connectors and wiring. A 31-inch cabinet depth is recommended to provide ample space for cable routing particularly for cabinets with multiple enclosures.

The 16-slot 6000 mainframe and 6001 slave enclosure are 14-inches high. The three-slot 6010 mainframe is 5¼-inches high. Since cooling and cable routing is included enclosures may be stacked one on top of another utilizing the full cabinet space.

Transducer input and control cables connect to the front of the input/output module as shown. Termination boxes are available to relocate the input connections and provide a means for terminating thermocouple wire.

6000 Mainframe Showing Input and Output Connectors

2-1.1.1 Mounting

Enclosures should be mounted on “L” rails, (Pacific P/N 36C8861), secured to the sides of the cabinet. Screws through the front flanges secure the enclosure. Mounting only by the flanges (without support) is not recommended.

2-1.1.2 Cooling

All Series 6000 enclosures have forced air cooling. Air enters the enclosure at the rear through a removable filter, flows through the power supply area then is forced by fans up through the input/output modules. Air exits the enclosure through the built-in cable passage at the top. Care should be taken to dress cables such that they do not block airflow. Bundling the cables in groups of 4 is recommended.

It is recommended that the air filter be cleaned at least once a year and more often if the 6000 is used in a dirty environment. To clean, remove the rear panel to access the filter that is on the inside of the panel. Remove the four screws that retain the filter. Clean with air or by washing in a mild detergent.

2-1.1.3 Power

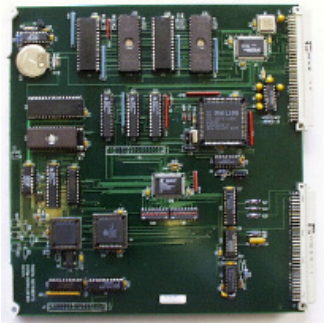
A power cable is supplied with each enclosure that plugs into the AC power input on the rear panel. A power switch is located inside the front door immediately below the input/output modules and controls power to the enclosure and modules. The power switch and a green LED on the front of the enclosure are illuminated when power is on.

Enclosures are wired for 115/230 VAC operation. A switch on the rear panel next to the power connector determines line voltage. The power fuse is located between the power switch and connector assembly. It is changed by removing the power cord and inserting a screwdriver tip in a slot just inside the plug receptacle. Fuse is 5mm by 20mm, 250 Volt, 3.15 Amp (115 VAC) or 1.5 Amp (230 VAC), slow blow. It is available from Littlefuse (P/N 2183.15) and Panel Components Corporation (P/N 81412541). The holder has provision for storing a spare fuse.

2-1.2 RequiredSettings

Identify the input/output modules, system controller, Assembly No. 0A8628, and channel controller, Assembly No. 0A8816, which may have been separately packaged for shipment.

System Controller



Each enclosure requires a channel controller, which is supplied with the enclosure. For mainframe enclosures it is a 6090-M and for slave enclosures it is a 6090-S. The mainframe enclosure also requires a 6091 system controller. The orange tag on the lower card lock identifies control cards.

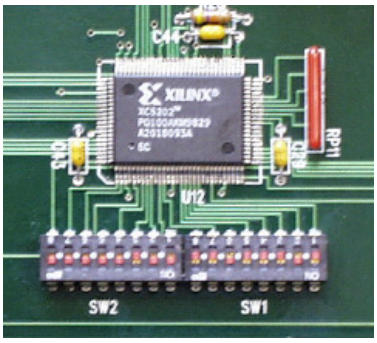
The system and channel controllers for the mainframe attach together in a single assembly by connector pins and sockets that carry signals between the boards. They must be put together before insertion in the enclosure. Use care installing the system controller on the channel controller. Make sure that the pins are properly aligned and are not bent.

2-1.2.1 System Controller

Switches on the system controller, 6091, must be set to specify the characteristics of the computer interface.

The switches make a 16-bit register that reads from the right. That is, position 1 of SW1 is bit 1. Set bits 1 through 5 (bit 1 is the LSB) to the desired IEEE-488 address for the system. The factory default is address 29. This address must not conflict with any other device on the same IEEE-488 bus.

System Controller Switches



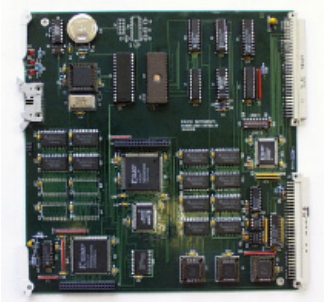
Bit 11 (position 3 on SW2) selects the output data byte order. Bit 11 off selects low byte then high byte. Bit 11 on selects high byte then low byte. Factory default is off.

Bit 12 (position 4 on SW2) disables automatic IEEE-488 address selection. On is disabled and is the factory default. If automatic detection is desired change this switch to off in which case the setting in bits 1 to 5 is ignored.
Bits 6-10 and 13-16 are not used and are normally set on.

2-1.2.2 Channel Controller (6090)

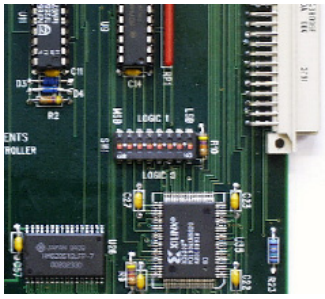
The enclosure address must be entered in switches on the mainframe and slave channel controller cards setting the addresses for channels in the enclosure. For example, if the enclosure address is 5 then the first channel in the enclosure will be addressed as 5,0,0 (enclosure 5, module 0, channel 0). The address in binary is set in S1 on the channel controller, positions 1 to 5, where position 1 is the LSB. The switch “on” position is logic “0”. The figure above shows the mainframe enclosure address switch with the factory default address 0.

Channel Controller



It is not necessary that enclosure address 0 be the mainframe. Any enclosure may have any address, however consecutive addresses are recommended to simplify operation. Assuming the mainframe is addressed as the first enclosure it is not necessary to disassemble the system/channel controller assembly to change this switch.

Channel Controller Switches



2-1.2.3 Input/Output Modules

Input/output module settings are covered in the manual section pertaining to each specific model.

2-1.3 Module Installation

A door and removable panel on the front of mainframe and slave enclosures give access to the input/output and control modules. The panel, which has the status LEDs, covers the control modules. It is removed by depressing two spring loaded pins on the top corners (see photo below) and tilting out.

The door on the right side covers the input/output modules. It is opened by pressing it inward on the left side. This door may be completely removed, which is convent for installation and wiring. The enclosure may be operated with or without the door, in fact cooling is somewhat improved with the door removed.

Slide the modules into the enclosure on the guides that hold the module in the frame. The module is inserted with the component side facing left (“Pacific” label up and model label down). It is necessary to lift the plastic bar covering the guide to get the card started. The card retainers must be positioned at right angles to the card. Slide the card all the way in until the connectors begin to engage. Close the card retainers, which will complete connector insertion and lock the cards in place. When fully closed, the retainers should “click” into place on the module.

Card Guides and Retainer

2-1.3.1 Input/Output Modules

Install from left so modules can be added without total reprogramming test files.

Enclosure slots are numbered 0 to 15 from left to right. Any type of input/output module may be inserted in any slot. Section 2-3.4 will cover assignment of module types to slots.

Input/output modules can be removed or inserted safely with power on. However, transients generated during extraction or insertion may disrupt programming of other channels in the enclosure. It is necessary to Reset the enclosure after channel removal or insertion to restore programming to the replaced channel and other channels. A Reset instruction may be used. Powering the enclosure down and then up also restores channel programming and is the preferred method.

RECOMMENDATION: Turn power off whenever changing input/output modules or controllers. Turning power off, then on, reinitializes programming of the channels in the enclosure eliminating the possibility of corrupted programming.

2-1.3.2 Channel Controller

The channel controller installs in the second slot from the left. It will not install in the system controller or input/output module slots. In the mainframe it is attached to the system controller.

Channel programming is stored in the channel controller and it will be necessary to reprogram by computer if the channel controller is changed. Parameters are stored in non-volatile memory therefore removing the channel controller, in itself, will not erase the programming. Switches on the channel controller must be set to the desired enclosure address, refer to Section 2-1.2.2.

2-1.3.3 System Controller

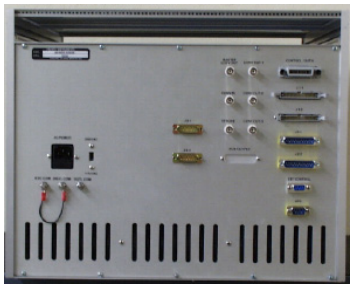
The system controller is installed in the leftmost slot of the mainframe. It will not install in the channel controller or input/output module slots. Switches on the system controller must be set for the desired IEEE-488 system address and data format, refer to Section 2-1.2.3.

2-1.4 System Connections

Required connections in a system with mainframe and slave enclosures, exclusive of measurement and control signals, which are covered in other sections, are calibration bus, address/data bus, control/alarm bus, convert signal, strobe signal, IEEE-488 interface and power. In the case of a mainframe only system, only the calibration bus, interface and power connections are required.

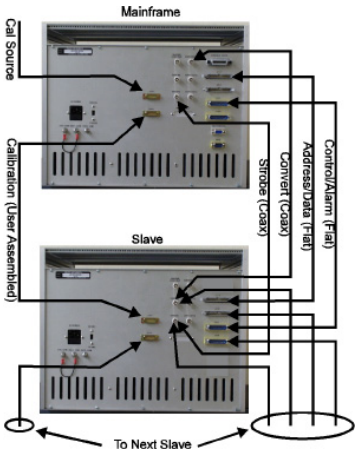
In addition there are control inputs to the mainframe that may be required. All of the required connectors and cables, with the exception of the IEEE-488 cable are supplied with the mainframe and slave enclosures.

Rear Panel of 6000 Mainframe



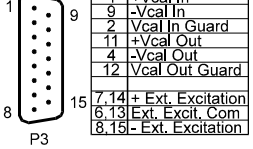
2-1.4.1 Multiple Enclosures

The following connections are all required for systems with multiple enclosures. Use of the calibration bus will depend on individual applications.



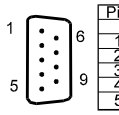
Calibration Bus

Two parallel calibration connectors, J3-1 and J3-2, are provided on the enclosures to enable “daisy chain” wiring of the system calibration bus. This bus is used with many of the transducer signal conditioning channel modules to provide an external programmable voltage calibration source. These connectors also have the external excitation input used for ICP transducer excitation. Mating connectors are supplied.



P3
Calibration Connector

Pin	Function
1	+Vcal In
9	-Vcal In
2	Vcal In Guard
11	+Vcal Out
4	-Vcal Out
12	Vcal Out Guard
7,14	+ Ext. Excitation
6,13	Ext. Excit. Com
8,15	- Ext. Excitation



External Control
Connector

Pin	Function
1	Digital Com
2	-Mark
3	-Trigger
4	+Power
5	+5V Digital

Address/Data Bus

Two parallel connectors, J1-1 and J1-2, are provided on the enclosures to enable “daisy chain” wiring of the address/data bus. A cable with Berg type connectors is supplied with the slave enclosure to make this connection.

Control/Alarm Bus

Two parallel connectors, J2-1 and J2-2, are provided on the enclosures to enable “daisy chain” wiring of the control/alarm bus. A cable with 25-pin type D connectors is supplied with the slave enclosure to make this connection.

Convert Bus

CONV OUT on the mainframe provides **ADC** convert timing signal to slave enclosures. The three **BNC** outputs **CONV OUT 1, CONV OUT 2** and **CONV OUT 3** are separately buffered and each can drive 10 or more slave enclosures. Distribute the three outputs evenly to the **CONV IN** of all slave enclosure using the **BNC** tee provided.

Strobe Bus

STROBE is a timing signal that synchronizes data transfers. It is distributed from the mainframe to all slave enclosures by BNC cable. It is connected from the mainframe to the fist slave as shown then to succeeding slaves using the BNC tee provided.

2-1.4.2 Mainframe Control

The following connections are made on the mainframe. Only the IEEE-488 is required, others are optional.

Master Convert Out

TTL convert timing signal. **MASTER CONV OUT** may be used to synchronize other equipment. Convert occurs coincident with the leading (trailing)? Edge. Not present on slave enclosures.

Convert In

The mainframe **CONV IN** is a TTL input for synchronizing conversions with an external timing source. Clock requirements? If this input is not present, mainframe automatically uses internal clock as the timing. This should not be confused with CONV IN on a slave which requires a bus connection to the CONV OUT on a mainframe.

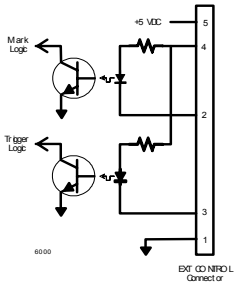
IEEE-488 Interface

The **CONTROL/DATA** connector is the computer interface on the mainframe enclosure. It connects to the interface card in the computer using an IEEE-488 type cable. The GPIB address set for the system controller card must correspond to the selected device address in the user's device driver software.

Mark & Trigger Controls

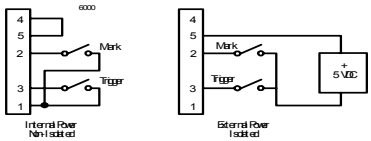
The Mark input controls a flag in the header of the output data frame. PI660 can use this flag, when enabled, to start and stop data recording. The TRIGGER input is one source for the signal that freezes the ring buffer.

As shown in the following diagram, the mark and trigger inputs are optic isolated. The user has the choice of employing power from the mainframe or external power for activating these inputs. Using mainframe power defeats the isolation provided by the optic coupling.



The following diagram shows the recommended wiring for the mark and trigger inputs using mainframe power and external power. The switches can be relays, open collector or other logic circuit capable of sinking10 mA.

Recommended Trigger and Mark Control



2-1.4.3 Grounds

The 6000 system has three floating grounds (commons) all of which must connect and return to facility or power ground.

Digital common appears on the GPIB interface and connects to facility ground at the computer to which it is connected. It is also present on the terminal **DGTL COM** on the rear panel.

Analog common is the low side of the analog outputs. It also appears on the terminal **ANLG COM** on the rear panels. Analog and digital commons are connected in the 5500. It is usually not desirable to wire the analog ground to facility ground or externally to digital common. Excitation common is the low side of the excitation power supply for all channels in the enclosure and is connected to **EXC COM** terminal on the rear panels. It must connect to facility ground preferably at a single point to minimumize common mode voltage and noise. This is best done by a connection close to the transducers. If the transducers are floating or excitation power is not used it can be connected to analog common by installing a jumper between EXC COM and ANLG COM on the rear panel of the enclosures. This jumper is factory installed and should be removed if excitation is grounded elsewhere.

Important: The excitation common must be connected to facility ground or analog common even if the excitation power supply is not used.

2.1.5 Interface Installation

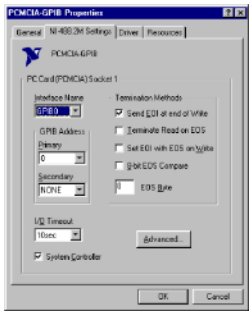
The IEEE-488 interface must support HS 488 high-speed protocol. The following National Instruments interfaces are recommended.

PCI-GPIB with NI-488.2M drivers for PCI bus (Pacific P/N 9000-155 for Windows 98 or P/N 9000-156 for Windows NT)

PCMCIA-GPIB with NI-488.2M drivers for laptops using Windows 98 (Pacific P/N 9000-154)

AT-GPIB/TNT with NI-488.2M drivers for ISA bus, (Pacific P/N 9000-153).

The National Instruments interfaces may be plug-and-play or non plug-and-play. The PCI interface must be ordered for either Windows 98 or NT and will provide the highest performance. The PCMCIA-GPIB will support up to 200K throughput while the AT-GPIB/TNT will support 500K or higher. The PCI-GPIB is the preferred interface and has been benchmarked at 1M throughput with a Pentium 266.

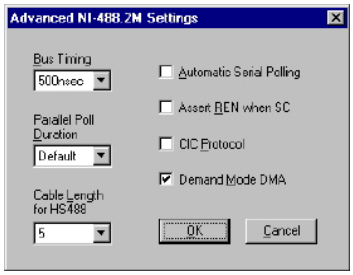


The NI GPIB interface drivers must be configured for the 5500DAS. The following instructions are for the AT-GPIB/TNT interface under Windows 98, but similar procedures apply to other models.

Start Windows 98 and go to Control Panel. Select System, which brings up the System Properties. Go to Device Manager. Under Device Manager NI GPIB Interfaces should appear if the NI card and software are installed properly. Under NI GPIB Interfaces highlight AT-GPIB/TNT and select Properties. The following screen should appear.

The screen as shown is the default. No changes should be necessary unless the interface was previously configured for another device.

Click the Advanced button on the AT-GPIB/TNT Properties screen above. This brings up the Advanced NI 488.2M Settings.



Configure the settings as shown. Note that the Cable Length for HS488 should be the actual length of the GPIB cable. If communication problems are encountered try changing this parameter. Make sure that automatic polling is disabled as shown.

This completes the interface installation and settings. PI660 software sets GPIB address and settings for the 6000DAS according to user entered setup values. It is not necessary to configure these settings using the Device Manager unless the 6000DAS is being used with software other than PI660 or is being tested with the National Instruments Utility IBIC, see Section 2-2.2.

2-2 Preliminary Checkout

After module configuration and enclosure, module and connector installation are completed these procedures will verify that the 6000 system is operational and ready for programming.

2-2.1 Power Control

A switch behind the front door applies power to the enclosures. When power is on, green LEDs labeled “PWR/ADR” on the front panel will illuminate.

Three seconds after the master enclosure has been powered up it send a Reset to the channel controller in all connected slave enclosures and it’s own. This Reset initializes the system by loading the last programmed operating parameters to all channel modules. It is very important in multi-enclosure systems that all enclosures be powered up simultaneously or that the mainframe enclosure be powered up last such that the slaves are on line when the Reset is issued.

An IEEE-488 Selected Device Clear instruction also initializes the system. Therefore, a Selected Device Clear after powering up the system will accomplish the same end.

IMPORTANT: Systems consisting of two or more enclosures must either have all enclosures powered up simultaneously, the master enclosure powered up last or must have a IEEE-488 Selected Device Clear instruction after power is applied to all enclosures.

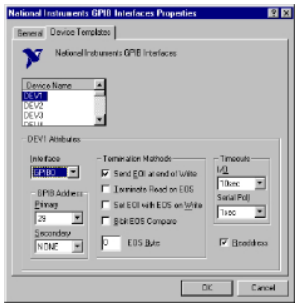
2-2.2 Interface Test

PI660 software tests the interface on startup. If PI660 starts without hardware error messages, one can assume the interface is working properly.

It is possible to test the GPIB interface using a utility program from National Instruments called IBIC. It enables sending program instructions to the 6000DAS and displaying the system's response. If a problem occurs, IBIC is useful to determine if it is related to the computer, interface, system or software.

In order to run IBIC or use software that does not automatically set GPIB address and settings one must use the Windows Device Manager to setup the Device Template.

Start Windows 98 and go to Control Panel. Select System, which brings up the System Properties. Go to Device Manager. Under Device Manager NI GPIB Interfaces should appear if the NI card and software are installed properly. Highlight GIPB Interfaces and select Properties. The following screen should appear.



Setup the device template as shown above. The device name can be any selection except DEV0, which is usually reserved for the interface board. The Primary device address is the bus address of the 6000 mainframe. The factory default address is 29.

IBIC is delivered with the National Instruments software for the GPIB interface. It runs as a stand-alone program.

Run IBIC.EXE the Interface Bus Interactive Control program. At the semicolon prompt enter "ibfind dev1" to establish the bus address of the 6000 Mainframe. The prompt will change to "dev1:". Program instructions may now be sent to the system. One of the power LEDs on front panel will blink when instructions are received. If the instruction is addressed to an input/output module the Module LED will blink, if addressed to the DDS the Multiplexer LED will blink.

The following procedure should be performed first on the mainframe with any slaves disconnected. Then slaves connected and the procedure repeated for each slave. These instructions select the first input/output module in each enclosure and turn on it's LED. The first module must be a type with the indicator LED, i.e. 6013, 6014, 6018 or 6033.

dev1: ibwrt "s0"	Select channel address 0
dev1: ibwrt "C1L1"	Turn on LED
dev1: ibwrt "C1L0"	Turn off LED

Since there are 16 slots in the enclosure and 64 possible channels per slot the address of the first channel of the second module is 65 and the first channel on the first module in the first slave enclosure (channel controller address 01) is 1024.. This applies even if the mainframe is a 3-slot 6010.

2-3 Operation

This section covers basic operation and programming of the 6000DAS using GRASP-PI660. If custom software is being developed to operate the 6000DAS use the instruction set covered in Section 11.

It is not the purpose of this section to provide a complete working knowledge of PI660 software. This section has the basic information necessary to operate the 6000DAS. PI660 offers many additional capabilities that are explained in its User Manual. Consult the input/output module manual sections for channel specific programming.

2-3.1 Starting PI660

GRASP-PI660 is provided on installation disks. Run “install.exe” on disk 1 to install the program on your computer. Follow the on-screen instructions.

Running “pi660.exe” starts GRASP. When the program starts a screen greets you with menu items across the top, a recording toolbar and a screen to open tests.

Test files (*.tst or *.mdb) store the programming and calibration information for a test. The *.mdb file is ODBC compliant and may be generated or opened by any database program such as Access or Dbase that is ODBC compliant. The *.tst file is a binary data base file that is generated and read by PI660. Binary files are much faster to use particularly for large systems.

If test setups will only be done on the 6000DAS’s computer then using *.tst files is the most expedient. If setups will be done on other computers using database software or sorting and printing of setup information is desired the *.mdb files must be used. PI660 will generate *.tst files from *.mdb files and *.mdb files from *.tst files using the “Save As” item in the Files menu. If using *.mdb files for program generation and archive it is highly recommended that they be converted to *.tst files when loaded and used on the 6000DAS. This will speed operation by eliminating use of the ODBC driver. They may be converted back to *.mdb files for archive and test parameter printing.

PI660 stores tests in subdirectories under the directory in which PI660 was installed. The subdirectory is the test name or number. All setup screen and raw data files for the test are stored in this subdirectory. If multiple runs are used, raw data is stored in multiple data files each with an assigned or sequential run number.

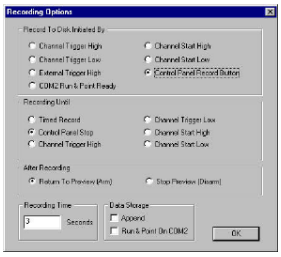
In order to operate the 6000DAS, a user must first open a test file. The “Open” screen, present when PI660 starts, enables the user to select a test to open.

Usually a new test is started by opening an existing test, making the necessary programming changes then storing it with a new test name using the “Store As” command in the File menu. Alternatively, one may select “New Test” in the File menu to build a test file from scratch. PI660 comes with a test file named **demo** that can be used initially. PI660 can be run without hardware to gain familiarity with its operation or to program tests off-line. It will notify the operator if the GPIB interface is not found. By clicking “OK”, the program continues without hardware.

Open a test (demo in the case of a new installation) by clicking the **demo** subdirectory then the **demo.tst** file. The screen will now show the last used displays. Like test files, screen files are stored in the test subdirectory where they were created. Another screen display can be selected by using the Open Screen command in the Windows menu. Screens may be modified and saved as new screen files using the Save Screen As command under the Windows menu.

2-3.2 Options Selection

The first task is to set the software options according to hardware and operational requirements. Under the Options menu, select Recording Options. The following screen appears.



Recording may be initiated by any of the items listed in the first field. The Control Panel Record Button is the red hexagon on the toolbar. It is the default selection for starting recording. Mainframe enclosures have the external control inputs. One of the external inputs, Mark, may be used to start and stop recording. The Mark input sets a bit in the data frame header. PI660 monitors the Mark bit and can be configured to start or stop recording on the mark bit going high or low.

Recording may be stopped by any of the items listed in the second field. These include the control panel Stop button, which is the square black button in the toolbar, the Mark external control or after a preset recording time. The default is the control panel Stop button.

The third field determines if the system will return to preview mode or stop after recording. In addition the duration may be entered for timed recording.

The third item under Options is Locations & Capabilities. This screen enables you to enter the locations for Microsoft Access and the Analysis software so that these auxiliary programs can start from buttons and menus. You can add two additional programs that are started by Names in the Analysis menu.

The important area of the Locations & Capabilities screen is the Software Capabilities fields. Here you should check any of the items that apply to this specific system. Do not check any fields not supported by the 6000DAS hardware configuration.

Finally, under checking you have the ability to turn off the “nag” boxes that require the operator to verify critical operations. It is suggested these remain enabled until the operator gains familiarity with the system and software operation.

2-3.3 Channel Address

Physical channel locations are mapped by PI660 into a flat address space wherein channel addresses are consecutive. Non-existing channels are ignored. For example, each enclosure slot has 64 physical address spaces assigned but a 6033 module has only 8 channels. If the first two slots contained 6033 modules their addresses would be 0 to 7 on the first and 8 to 15 on the second.

Care must be used when changing input module types. Since different types may have more or less channels the channel address map and channels names may be corrupted. Therefore, PI660 resets the channel names if a new configuration is made i.e. card types are changed.

Warning: Changing the type of input/output module requires reprogramming all channels.

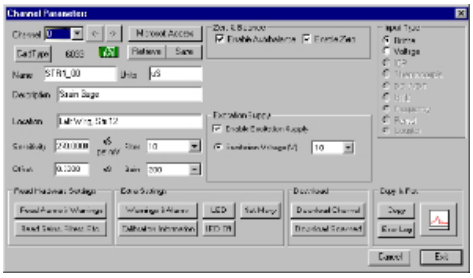
Now PI660 is ready for setting up the channel parameters for measurement. Note that all Channel Names have defaulted to Channel N where N is a consecutive number. If other parameters, i.e. gain, filter, excitation, warning and alarm limits, were previously programmed for this location they have not been changed by reconfiguration.

2-3.5 Channel Parameters

Channel parameter programming is specific to the type of input/output module. Once the module types are assigned the Channel Parameters screen will automatically be configured for the installed module. Specific channel parameter programming is covered in the manual section pertaining to each input/output module.

The channel module programming information, i.e. gain steps, filter frequencies, etc., are located in a special file, 6000card.ini located in the Windows directory. This file can be updated, as new modules become available. It can also be reconfigured using a text editor to accommodate special module configurations or in-field changes.

The Channel Parameters screen for the 6033-3 is typical and shown below. There are fields for programming operating parameters, engineering units and slope and offset engineering units conversion. The Warnings & Alarm button brings up a screen to program the warning and alarm levels and enable or disable alarms for the channel. The LED On and Off buttons control the LED on the input/output module and are useful to quickly find a channel's physical location.



In the lower right the "graph" button displays a quick plot of the last recorded data for this channel and test enabling the programmer to see if the operating parameters are reasonable. The Clone button applies the programming for this or another selected channels to other channels to minimize the operator input. Download Channel and Download Scanned send saved settings to the hardware for this channel or all active channels in the scan list.

The Calibration Information button brings up a screen that programs up to ten calibration points. These can be voltage substitution calibration, shunt calibration or any other calibration mode provided by the hardware. Each point may be given a corresponding value for calculating the engineering units conversion equation from the resulting calibration data.

PI660 acquires 100 samples for each calibration point and calculates the mean and standard deviation. The mean is used for engineering units calibration. The mean and standard deviation are viewed on the Calibration Details screen. Further calibration information is contained in the PI660 user manual.

2-3.6 Digital I/O

This menu selects screens that control the digital outputs. The digital inputs are recorded with other measurement channels. The sample rate for digital inputs is selected by scan list programming.

The Runtime Settings screen has programming for four 16-bit output vectors that can be issued at programmed times during a test.

The Immediate Settings screen provides the means for direct setting digital outputs. It also has an options box that enables the “glitch catcher” mode of operation.

2-3.7 Alarm

Analog and digital input modules generate alarms and warnings. Alarms may be out-of-limit measurements, specific digital input bit patterns or General alarms associated with some specific operating function like excitation open or short. The alarms and warnings can generate digital output vectors that may be used to control external equipment.

The complexity of alarms and warnings is such that a separate section is dedicated to their use. It is recommended that warnings and alarms be turned off while the system is commissioned. Once familiar with system operation, warnings and alarms may be programmed as desired.

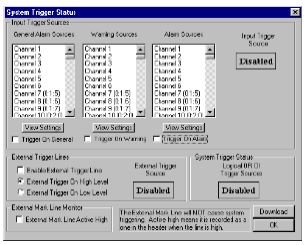
To disable warning and alarms, go to the Alarm menu and select the Digital submenu. Click on Disable Digital Alarms. Then select the Analog submenu and click on Disable Analog Alarms. Now the system is ready to operate without alarms and warnings. Going to the Alarm menu and clicking on Read Alarm Status displays warning and alarm status. This is useful to determine if inadvertent alarms are effecting system operation.

2-3.8 Trigger

Trigger is the mechanism by which pre and post event data is captured in the ring buffer memory. Like alarms, triggering is a complex subject and is covered in a separate section. It is recommended that triggering be disabled for system commissioning. Once familiar with system operation, triggering of the ring buffer may be programmed as desired.

From the Trigger menu select System Triggering, which brings up the following screen. Under Input Trigger Sources, clear the Trigger On General, Trigger On Warning and Trigger On Alarm check boxes. Under External Trigger Lines, clear the Enable External Trigger Line check box. If done properly, the System Trigger Status field should indicate Disabled. Select Download to send these settings to the 6000DAS. Now the system is ready to operate without triggering for the ring buffer.

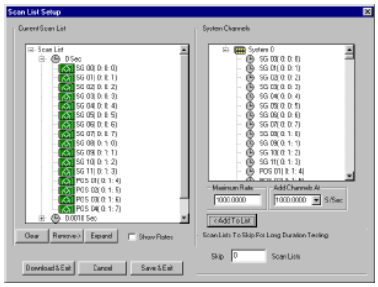
System Triggering Screen



2-3.9 Scan List

It is necessary to define the scan list for all 6000DAS applications. PI660 has a graphical scan list setup that minimizes the time to make these settings.

In the Scan List menu, select Define Scan List to open the following screen.



On the left half of the screen is the scan list as it is presently configured. On the right side are channels in the system. Each channel type is indicated by a unique icon and by the Tag Name assigned in the Channel Parameters screen.

The Current Scan List is a graphical picture of the output data frame. The scan list is broken into intervals, each equal to the highest sample rate (period). For example, if the highest sample rate is 1000 samples per second (s/s)., each interval represents 1 millisecond. A channel that appears in each interval is sampled at the highest rate, in this case 1,000 s/s. A channel appearing in every other interval is sampled at ½ the highest rate or 500 s/s.

In the above example, Accel_01 is sampled at 1,000 s/s, the Digital inputs are sampled at 500 s/s and Accel_02 is sampled at 250 s/s.

To add channels to the list first, select the desired sample rate in the Add Channels At box. This will be a binary sub-multiple of the Maximum Rate. Then select those channels to add at this rate. When a channel is selected, a red arrow appears indicating that it will be added to the scan list. Click on Add To List to make the addition. Continue until all desired channels are added. Then Download & Exit to send settings to hardware or Save & Exit to save settings in database for future downloading.

A clock icon on the right side of the screen replaces channels that have been previously added to the scan list. Channels are removed from the scan list by highlighting and clicking Remove.

PI660 automatically builds the scan list as the operator enters channels and sample rates. If more or fewer time intervals are needed, they are automatically added to the output data frame.

At the bottom of the Scan List Setup window is a field to select scan list skipping. On long duration tests it may not be necessary or desirable to record every scan of data. Entering 0 causes the 6000DAS to output every data scan, entering 1 outputs every other scan and so forth.

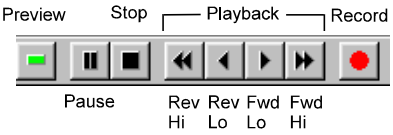
This does not affect data going to the ring buffer. Every scan is recorded in the ring buffer providing a high resolution record that can be frozen by the trigger function.

2-3.10 Acquiring Data

Sections 3-3.2 through 3-3.9 include all the required programming to run PI660 and acquire data. PI660 has many other facilities, calibration and real-time displays are examples, that will aid the acquisition process but are not required. These are covered in the GRASP-PI660 User Manual.

The PI660 toolbar simplifies operation. It quickly selects operating functions bypassing the menu. As the cursor is moved across the buttons, the button's function is explained in a text box. Below are the buttons for preview, recording and playback.

Recording Toolbar



Assuming that the Recording Options have been set to start and stop recording by Control Panel, data recording is started by the Record button and stopped by the Stop button. Preview may be selected to view data without recording. Record may be started directly from preview. However, it is important to stop preview or recording before making any changes to hardware programming.

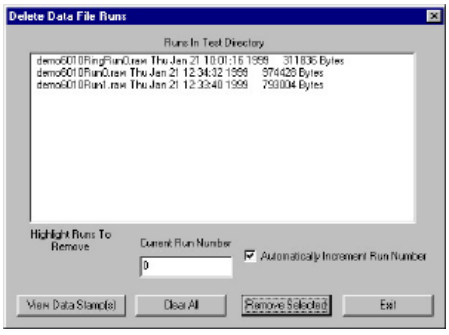
Warning: Exit Preview and Record modes using Stop button before making hardware programming changes.

The two text displays in the toolbar indicate preview recording or playback time and recording status respectively. The status window also indicates the recording mode, i.e. Overwrite where the file data is replaced or Run Number which adds a new run file for data.

2-3.11 Data Files

Continuous data is recorded to a binary raw data file. Each data file has an ASCII "stamp" appended. The stamp contains the scan list structure and sensitivity, offset, gain and card type for each channel in the scan list. It enables exporting data to other applications for analysis. Clicking View Data Stamp opens Window's NotePad or WordPad for viewing the information. Data files are managed by selecting Manage Data Files from the Files menu. This window lists all the runs recorded and saved in test's subdirectory. Each run is its own file ".raw" extension. Files are named with the test name given to the test subdirectory plus "Run" plus the run number, i.e. "testnameRunXX.raw". Run number is automatically incremented after each recording. This screen also lists the date and time of recording the file and the size of the raw data file.

Manage Data Files


Delete Data File Runs
Runs In Test Directory
demo6010RingRun0.raw Thu Jan 21 10:01:16 1999 311836 Bytes
demo6010Run0.raw Thu Jan 21 12:34:32 1999 974428 Bytes
demo6010Run1.raw Thu Jan 21 12:33:48 1999 793004 Bytes
Highlight Runs To Remove
Current Run Number
0
Automatically Increment Run Number
View Data Stamp(s)
Clear All
Remove Selected
Exit

This screen may also be used to delete specific test runs or delete all test in the subdirectory. It also selects a "Current Run" for playback.

2-3.12 Single Scan

Next to the red Record button in the Toolbar is the single scan button that is also red but has a "1" in the center. This button causes data from a single pass through the scan list to be recorded in a delimited ASCII text file in the test subdirectory. Name of the text file may be specified in the Recording Options window opened from the Options menu.

Each time the single scan button is activated, another pass through the scan list is added to the text file. Each pass is preceded in the data file by the date and time from the computer clock.

The text file, written by the single scan button, is compatible with most spreadsheets and database programs. Opened by Access the measurements are placed in columns headed by the channel name. The date and time of each scan heads the Rows. This format is convenient for plotting, printing and analysis.

2-3.13 Ring Buffer

A hardware ring buffer stores a selected number of the most recent data samples and can be used to recover pre and post-trigger event data even if such data was not recorded by the computer. Data is stored in the ring buffer anytime the system is in Preview or Record modes. It records all the scanned measurement data, up to the programmed ring buffer size limit, regardless of the amount of data that is transferred to the computer for storage.

Several modes are available to trigger the ring buffer for post-trigger data storage and are covered in Section 3. Data in pre-trigger storage occurred immediately prior to the triggering event.

Ring Buffer Programming

Selecting Define Ring Buffer from the Scan List menu programs the ring buffer. The Ring Buffer may be selected for use or disabled. Pre and post-trigger storage times are entered. Their sum cannot exceed the indicated buffer Duration that is calculated from the sum of all sample rates.

Three options are available to save the ring buffer once it is triggered. Stop DDS & Retrieve stops data acquisition at the end of the scan list and immediately transfers the ring buffer to the computer's disk placing it in the test subdirectory. It is necessary to restart recording to continue data acquisition and data will be recorded to a new file.

Interrupt DDS & Retrieve temporally stops data acquisition at the end of the scan list and transfers the ring buffer to the computer's disk, then automatically increments the run number and restarts acquisition at the beginning of the scan list to the new data file.

Retrieve Simultaneously transfers the ring buffer data interlaced with data from the scan list. This option could cause missed data at very high sample rates and is the slowest option for retrieving the ring buffer data.

(Second triggering of ring buffer?)

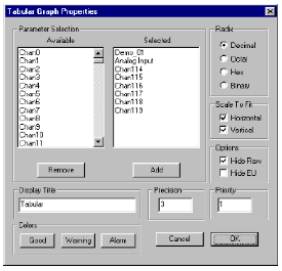
Data from the ring buffer is placed in a file in the test subdirectory named "testnameRingRunXX.raw", where testname is the test subdirectory name and XX is the current run number (same as scan list data).

2-3.14 Data Export

ASCII data export is a standard feature of PI660. The screen shown below enables selection of a single channel of all channels in a scan list, or ring buffer run number for export, and selection of output formatting and grouping. A section is provided to insert file header information.

2-3.15 Data Display

PI660's data displays work in the preview, record and playback modes. From the Windows menu, select New, which brings up a submenu of display types. Clicking on the desired display opens a display window. Selecting Multiple opens another submenu that selects multiple displays of the same type and is a quick way to populate the screen to display several measurements. Right mouse clicking in the new display window opens the display properties window.



In the display's properties window one can select the measurement parameters for display and the display parameters. The display window itself may be sized and moved by dragging on the screen.

PI660 uses a Multiple Document Interface Windows protocol to put multiple tabular and graphical displays on a single screen. Each display, except oscilloscopes, can have multiple measurements and individually taylored parameters. Once a screen is made, it can be saved using the Save Display As selection in the Windows menu. It is saved as a "*.dsp" file in the test subdirectory. Displays can be recalled by Opening them from the Windows menu. Opening a Test file automatically opens the most recently used display file.

When playing back recorded data to displays, it is first necessary to select a test run. Go to the File menu and select Manage Data Files. This brings up a screen listing the available data runs for this test. Enter the run for playback as the Current Run Number. Now any parameter recorded in that run may be displayed.

2-3.16 Data base

In order to increase speed, operating parameters, scan list and calibration data are stored in a binary test database. This database may be uploaded and downloaded from any ODBC compatible database such as Access or Oracle.

System programming may be done either with PI660 or an ODBC compatible database such as Access. If programming is done in Access, the settings are downloaded by the Retrieve button on the Channel Parameters screen or by the Access icon (with up arrow) on the toolbar. Programming is saved to Access by the Save button on the Channel Parameters screen or the Access icon (with down arrow) on the toolbar. The files created are compatible with any ODCC database editor.

programming is done in Access, the settings are downloaded by the Retrieve button on the Channel Parameters screen or by the Access icon (with up arrow) on the toolbar. Programming is saved to Access by the Save button on the Channel Parameters screen or the Access icon (with down arrow) on the toolbar. The files created are compatible with any ODCC database editor.

ASCII Export